REMARKS

In the office action, the examiner gave a final rejection to all claims (1-12). Claims 1-6, 8 and 10-12 are rejected under 35 U.S.C. §102(a) as being anticipated by PCT patent publication WO 00/48022, hereafter "Malinverno." Applicant respectfully traverses the examiner's rejection of the claims, and requests that the examiner reconsider the application in the light of the following comments. Applicants contend that the examiner has misunderstood the teachings of Malinverno, or the teachings of the present application, or both.

Malinverno describes construction of 3-D (see Fig. 3, diagram 42, 46, 50 or 54) reservoir models for multiple data types. (Malinverno, page 8, top paragraph; and claim 8.) The present invention (see paragraph 30 of the application) is a way to analyze well log data (essentially a one-dimensional model, varying in the vertical dimension and most valid near the well bore), and particularly data from subsurface regions having thin beds (subsurface layers of different materials), a difficult problem to treat by straightforward methods (such as Malinverno) because of the computer resources required to represent such fine-scale heterogeneity. Further, the present invention's analysis targets only a single property (data type): hydrocarbon pore volume. (See claim 1 of the present application.) While Malinverno's method could (but in practice, would not) be applied in a "brute force," inefficient way to the technical problem addressed by the present application, it would lack the features of the present inventive method that make it practical and efficient in utilization of computer resources.

One such feature is the treatment of thin beds by the use of "bed types" with statistically defined properties. (See paragraphs 32 and 39 and step (a) of claim 1 of the present application). Another such feature of the present application is (see ¶ 40, first sentence) the use of average values of the well log data, averaged over a selected analysis interval comprised of many thin beds of two or more bed-types. Estimates of values of various parameters of interest, e.g. porosity, for each selected bed type can be made based on core data or regional knowledge, and similarly for estimates of

frequency of occurrence of each bed type. These estimates are combined to produce estimates of average log values over the analysis interval, which are then compared to actual well log measurements averaged over the same interval, and the model is then adjusted accordingly. (See Summary of Invention section) Figure 5 of the present application shows such an interval to be analyzed **42**, obviously comprised of many thin beds, each thin bed being of one of three types, **36**, **38** or **40**. Fig. 7 shows values for these average properties. The bed types and average values are central features of the present invention, not even suggested by Malinverno. The same is true of the aspect ratio feature of the present invention that accounts for thin beds of finite extent. This is dealt with in the present invention by the bed-type parameter called aspect ratio (ratio of bed thickness to bed width). See ¶ 28 and ¶ 32 of the present application.

Thus, it can be readily seen that Malinverno does not disclose step (a) of Applicant's claim 1:

> (a) defining an initial model of the subsurface formation based upon estimates of different bed types and bed-type parameters in the formation, one of said bed-type parameters being aspect ratio, the initial model including a system of log equations for predicting well logs from bed-type parameters;

Furthermore, Malinverno doesn't disclose step (b) of Applicant's claim 1 ("performing a Monte Carlo inversion to find the ranges of bed-type parameters consistent with the measured well log data") either because Malinverno doesn't work with "bed types."

Applicant's averaging of bed type parameters over the analysis interval is a feature of claim 3, step (b): "obtaining average values of the measured well log data over the analysis interval." Thus claim 3 contains a further novel feature over Malinverno.

If a reader of Malinverno were to try to deal with the thin-bed problem, he would know only to (using Applicant's model of Fig. 5 as an example) deal with interval **42** using the conventional approach to reservoir modeling, in which each geometric feature (including every thin bed) of the reservoir is represented explicitly. For example, see Malinverno's Claim 7, which speaks of using "a layered model having material properties associated with each layer". Or see the middle of page 8 (a passage cited by the examiner as disclosing Applicant's step 1(a), but which clearly does not), where Malinverno describes his model of the subsurface area only as "a layered medium representing a layered earth." Describing a thinly-bedded reservoir in this manner, dealing with each thin bed individually, without the efficiency of bed types, would require much more in the way of computing resources. Similarly, Malinverno's updating steps (see Fig. 1) would be very time consuming in the case of thinly bedded intervals without Applicant's device of averaging the well log data (referred to generically as "measurement data" in Malinverno) over the analysis interval.

Applicant has carefully read every passage in Malinverno cited by the examiner as disclosing claim 1, steps (a) and (b), and claim 3, step (b). Applicant finds nothing to support the examiner's contentions. For example, paragraph 2 of page 8 is cited in connection with both claims, but says nothing about bed types or averaging measured data over an analysis interval. In fact, it says the opposite insofar as categorizing each layer into a certain bed type ("a layered medium representing a layered earth with material properties that are constant or variable within each layer"). This wording says the model will treat each layer as unique even if it is very similar (same bed type) to several other layers.

A proper perspective on Malinverno's method as applied to model a subsurface region containing intervals dominated by thin beds is that Malinverno's method could greatly benefit by using Applicant's method to analyze the thin bed intervals and provide those results as inputs to Malinverno's method.

CONCLUSION

For the foregoing reasons, Malinverno cannot anticipate Applicant's claim 1, the application's only independent claim. Accordingly, all claims should be allowable. Applicant is filing this response within a 2-month statutory period, and requests an advisory opinion stating whether the examiner agrees with Applicant that all claims are allowable. If the Examiner wishes to discuss the application with counsel, please contact the undersigned.

Respectfully submitted,

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